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EDISON LAMP WORKS
OF GENERAL ELECTRIC COMPANY

GENERAL SALES OFFICE HARRISON, N. J.

The Lighting of Armories and Gymnasiums

Information compiled by
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Lighting Service Department

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The Lighting of Armories and Gymnasiums

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Armories

General Considerations

When one thinks of an armory, the drill shed alone is usually pictured; yet some of these structures are very elaborate indeed, having also a gymnasium, theatre, rifle ranges, bowling alleys, billiard room and the like.

The drill shed is, of course, the most important part of the armory and should receive the most attention. As a general proposition the usual form is a large open space with an arched roof. The size of those investigated varied from 600 ft. by 300 ft. (180,000 sq. ft.), 120 ft. high to 76 by 92 (7,000 sq. ft.), 38 ft. high. The roof is often partly glass to admit daylight and usually the iron work is exposed.

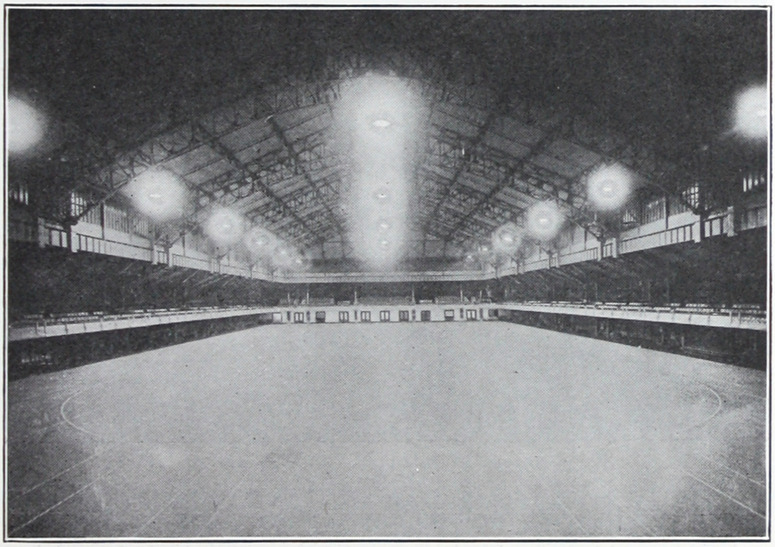

Fig. 1
Night Photograph of an Engineer Corps Armory (170 by 390 ft., 70 ft. to peak) Brick Side Walls, Light Green Ceiling, Pine Flooring, Lighted by 21 1000-watt Bowl Frosted Mazda C Lamps in Deep Bowl Porcelain Enameled Steel Reflectors Suspended by Steel Cables. Actual watts per square foot, 0.3—generated lumens per square foot, 6.0

Many drill sheds have balconies for the seating of spectators, necessitating special lighting below to prevent dense shadows which would result if only the general lighting was provided. The floor varies considerably depending on the branch of service, cavalry having a very dark brown tanbark; infantry, light hard wood. Naturally the character of the floor has a marked effect on the quantity of light which must be supplied. About twice the wattage must be used to illuminate to a given intensity the cavalry drill shed with its floor of low reflecting power in comparison with a shed with ordinary wooden floor.

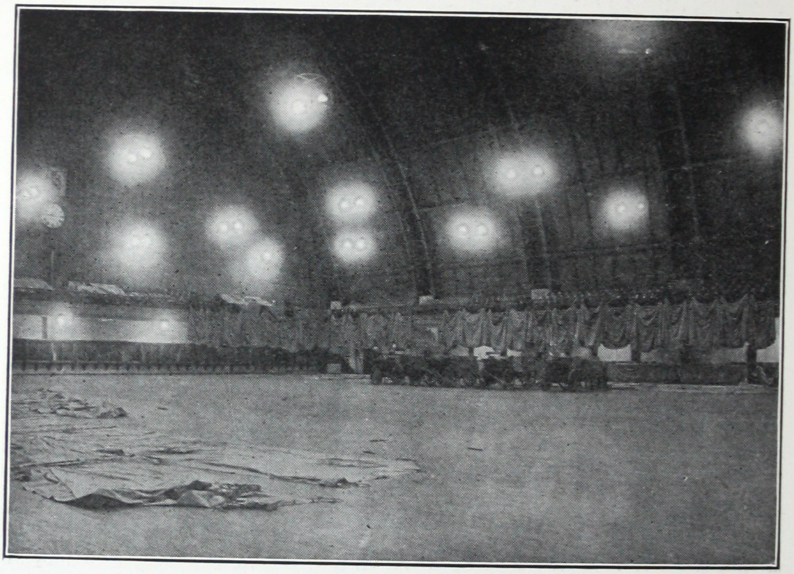

FIG. 2
Night View of an Infantry Armory (190 by 200 ft., 100 ft. to Peak) Brick Side Walls with White Wainscoting, Gray Roof, Wooden Flooring Lighted by 48 400-watt Bowl Frosted MAZDA C Lamps in Deep Bowl Prismatic Reflectors, 2 per Fixture. Actual watts per square foot, 0.5—generated lumens per square foot, 7.2

On account of the simplicity of operation and maintenance, the high efficiency of light production, the pleasing color of light, the steadiness and adaptability to reflectors giving any desired distribution of light, the MAZDA C lamp has become practically the standard illuminant supplanting all other forms of equipment, for lighting drill sheds. The large areas permit the use of high candlepower units and the lofty ceilings give hanging heights such that lamps are always well out of the ordinary angle of vision, overcoming any objection which might be raised on the question of intrinsic brightness. The wide range of sizes available make it possible to select a unit fitting any chosen spacing giving the desired intensity of illumination. Inexpensive fixtures, holders, sockets and reflecting devices are all standardized, thus avoiding the added cost of special designs which are sometimes attendant on propositions of these magnitudes. The character of the light makes it especially well suited as it has no very marked tendency to distort color values which are of importance on dress occasions.

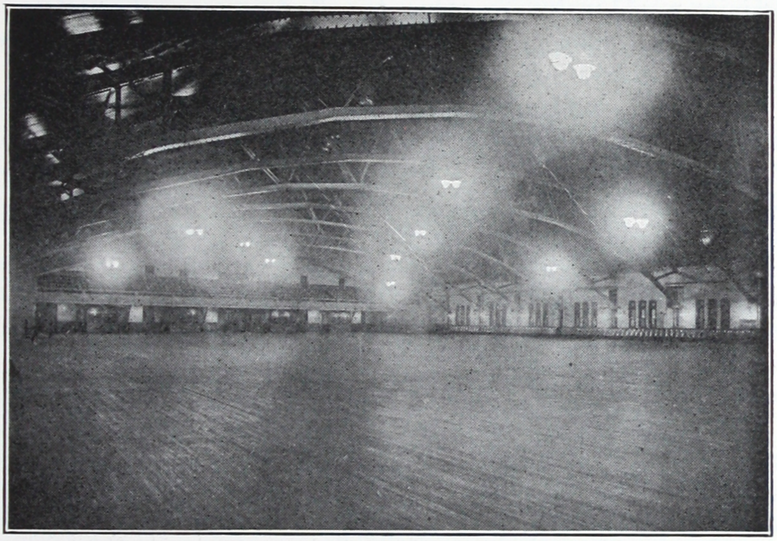

Fig. 3

Night View of an Infantry Armory (175 by 240 ft., 45 ft. to Peak) Cream Side Walls, Pine Ceiling, Dark Wood Floor, Lighted by 26 750-watt Clear Mazda C Lamps in Opalescent Enclosing Globe with External Porcelain Enameled Steel Reflector, Two per Fixture. Actual watts per square foot, 0.45—generated lumens per square foot, 7.1

The uses to which the drill hall is put are somewhat varied. The drilling of raw recruits takes place on only a portion of the floor and does not require the entire area to be lighted; battalion and regimental drills and reviews necessitate full illumination for ease of manœuvres and inspection; gun drills in the coast defense and artillery sometimes need all lights out; or the armory is often rented to charitable organizations and the like for fairs and bazaars, which demand brilliant lighting as well as special decorative or spectacular effects. In any event sufficient light must be provided in all parts of the room to meet the most exacting conditions.

Choice of Reflecting Equipment

Appearance is one of the factors which must be given consideration, as the general effect of the room must be attractiv particularly if used for other than regimental purposes. Efficiency must also be considered as there are large areas to be illuminated and an extravagant fixture would make the cost of proper lighting prohibitive.

Eye protection must be assured as glare in such work as gun training would materially reduce the effectiveness of the unit.

Since the ceilings are usually broken by trusses and often quite dark, as a general proposition direct lighting is essential.

In most cases it is advisable to use either a translucent reflector or a unit which permits some of the light to escape above the horizontal, for if the ceiling is totally dark the room seems unpleasant. Occasionally, however, the floor is light enough to reflect sufficient light back to the ceiling even if opaque bowl reectors are employed.

The type of distribution will vary with conditions. If the side walls are quite dark a unit giving a wide curve is inadvisable as far too much flux will be wasted by wall absorption. With light walls, however, the diffuse reflection will assist in the general illumination and concentration of the light is not as necessary.

In compiling the material for this bulletin a total of thirty armories were investigated as to equipment and spacing of units, condition of surroundings, etc. In regard to the reflecting equipment, the following applies:

Ten were provided with deep bowl dense opal direct lighting reflectors. This type of unit is low in first cost and efficient in directing light downward. It transmits a certain percentage of the light which serves to illuminate the ceiling.

Six were equipped with enclosing globes of opalescent glass with an external porcelain enameled steel reflector. This equipment is comparatively inexpensive, gives good diffusion and pleasing light. As a considerable portion of the light is in a horizontal direction the utilization constant is rather low.

Five of the armories employed deep bowl large mirrored glass reflectors which are very efficient in redirecting the light, although introducing comparatively little diffusion. They are rather high in first cost.

Four buildings utilized deep bowl prismatic glass direct lighting reflectors. These are efficient, of moderate price and have the property of transmitting a small proportion of the light upward.

Porcelain enameled steel reflectors of the deep bowl and dome types were installed in three of the armories. Such accessories are low in first cost, efficient, durable and simple to maintain. If the floor is light in color, sufficient light will be reflected to the ceiling to offset the fact that no light is transmitted by the units.

One armory employed enclosing globe units with no external reflectors. The amount received on the floor is a small percentage of the total flux. Such fixtures give excellent diffusion and are pleasing in appearance, although rather inefficient for this purpose.

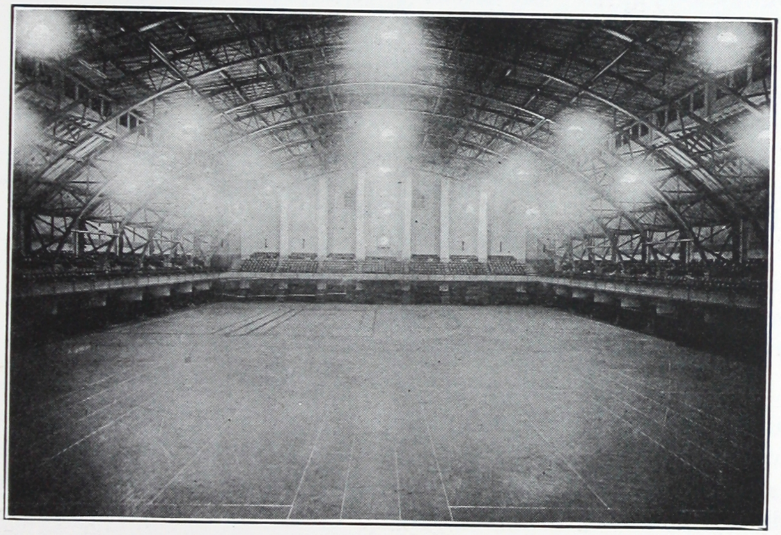

Fig. 4

Night View of an Infantry Armory (185 by 275 ft., 40 ft. to Peak) Green Side Walls, Green Ceiling, Light Wood Floor, Lighted by 28 1000-watt Clear Mazda C Lamps in Two-piece Prismatic Enclosing Units, Steel Cable Suspension. Actual watts per square foot, 0.55—generated lumens per square foot, 10.6. Average illumination, 3.3 foot-candles.

Ease of Cleaning and Renewals

On account of the high hangings employed, some sort of a lowering device should be provided. Most of the single unit fixtures weigh so little that a simple steel cable will safely support them, a cut-out hanger with lowering rope or wire simplifies this phase of building maintenance. In some cases the cut-out is omitted and the cable passes through a pulley, then down the sides of the room, the current-carrying wires hanging in loops.

The automatic cut-out hanger is a desirable feature where lamps are hung very high and where it would cost considerable to build scaffolding for renewing and cleaning lamps. In some armories, a walk is provided around in the roof trusses above the units from which they can be maintained. These trusses are usually very high and the construction of the walk must be carefully considered as the danger element is large.

Convenience of Control

Although often not considered this is an important point, for instance in the coast defense armories when practicing with the guns it is often desirable to hurriedly turn off any group of lamps. In some armories remote control is employed. The man in charge of the entire floor has a board with pilot lights and switches. At each gun are a number of push buttons; when the batteries are firing the officer in charge of the firing can at once signal for any group of lamps to be extinguished. The whole armory can be thrown in darkness in an extremely short time. With the system of lighting formerly employed it required twelve men for this work with the attendant delay.

Present Practice

Intensity of Illumination Desirable

From general considerations the cavalry and field artillery armories would require less light than those of the other branches of service, as they are not likely to be used for social purposes. This is counteracted, however, by the fact that the tanbark or loam floor absorbs a great deal of light and makes the place appear abnormally dark.

As indicative of modern practice the actual power consumption for the armories with wooden floors varied from .25 to .55 watt per square foot, the average figure being .37 watt per square foot. Lamps of varying efficiencies were employed in the different buildings making it necessary to compare results in terms of generated lumens per square foot. These varied from 4.4 to 10.6 with an average of 6.5. In most instances fairly efficient reflecting equipment was installed and the installations probably had a coefficient of utilization somewhere between 40 and 50 per cent. The illumination, therefore, varied from 2 to 5 foot-candles with the average in the neighborhood of 3 foot-candles. Actual tests in two of the armories investigated showed approximately 2½ foot-candles of illumination quite uniform in character.

In the armories with tanbark floors, the actual watts per square foot varied from .23 to .55 with an average of .34, The average generated lumens per square foot were 6.2. A test in one of these showed the illumination to vary between 2 and 4 foot-candles with an average of 3.25.

Color of Surroundings

The roof is usually of a dark tone; deep greens, grays and natural dark wood finishes seem to prevail. Lighter colors while desirable from a standpoint of light reflecting power, tend to show dirt accumulations more readily and are in general therefore not desirable.

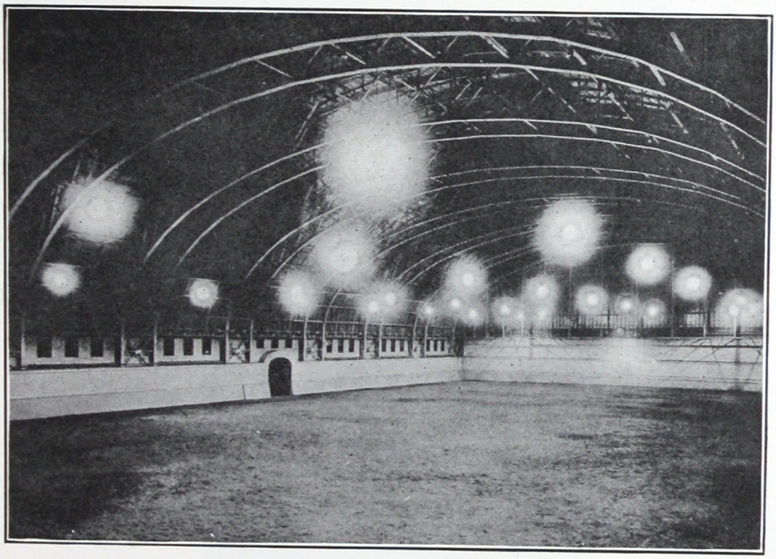

Fig. 5
Night View of a Cavalry Drill Shed (175 by 310 Ft., 70 ft. to Peak) Cream Side Walls, Cream Ceiling, White Sand, Shavings and Loam as Floor, Lighted by 31 750-watt Clear Mazda C Lamps in Deep Bowl Dense Opal Direct Lighting Reflectors, Steel Cable Suspension. Actual watts per square foot, 0.4—generated lumens per square foot, 7.8. Average illumination, 3.25 foot-candles

Lighter tones varying from white to natural brick are found as side wall coverings. The extremely large areas if finished in a very light tone would be somewhat annoying due to glare, but it is desirable that the upper part of the side walls be finished in light colors even though the lower portion is somewhat darker. This feature would make the lighting considerably more efficient and introduce a certain amount of diffusion. The question of the color of the floor has been mentioned before;—the lighter woods being advisable from an illumination standpoint.

Size of Lamp

The areas to be illuminated are large and the possible hanging height great. Therefore, as large lamps as are obtainable should be used. With incandescent lamps; in general, the larger the lamp, the more efficient it becomes. Present practice in armories investigated varied from 300 to 1000 watt units; the 750 and 1000 watt sizes predominating.

Type of Fixture

Practically no fixture is necessary for this class of service and the majority of buildings employ a simple steel cable as a support. In some of the older installations which have been remodeled, lamps are installed on multi-arm fixtures. A symmetric arrangement of outlets, the number of rows depending on the width of the building is and should be followed.

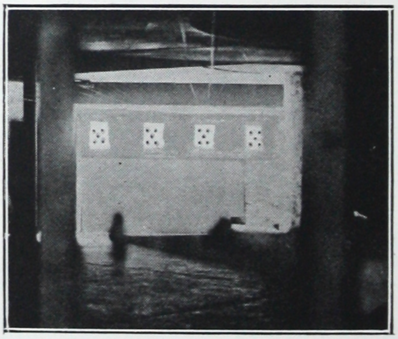

FIG. 6
Photograph Taken from Firing Point of Short Rifle Range. Targets Illuminated Locally by 50-watt MAZDA B Lamps in Angle Steel Reflectors

Rifle Range

The proper illumination of the rifle range is a subject of considerable importance and can scarcely be treated with a satisfactory degrees of completeness in a bulletin of this character. In the bibliography is found a reference to a very valuable paper which should be studied by those especially interested.

So many factors enter into the problem, such as glare, contrast, intensity, uniformity, surface brightness, type of sight employed and so on, that it seems inadvisable to attempt to outline the proper practice. Some authorities feel that an indoor rifle range should approximate out-door conditions and have employed floodlighting for this purpose, the main beam of the projector being trained on the target illuminating this to a high intensity and the stray light illuminating the sidewalls of the tunnel. This arrangement prevents the unnatural condition of a very bright object being surrounded by a totally dark area.

At some of the short range galleries, the targets are controlled from the shooting position by means of a continuous wire and hand wheel. Above each target position is located a 60-watt clear MAZDA B lamp in an angle steel reflector approximately 12 in. in front of and 18 in. above. This gives an average illumination on the targets in the neighborhood of 12 foot-candles.

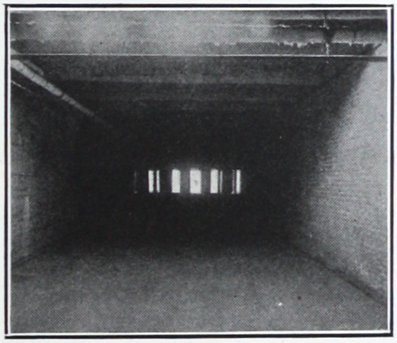

FIG. 7
Photograph Taken from the 50-yard Point of a Rifle Range, Targets of which are Illuminated by 25-watt MAZDA Lamps in a Mirrored Trough Reflector with Similar Equipment at Points Along the Tunnel as Described in the Text

One of the rifle ranges investigated was 120 yards in length and consisted of a tunnel 14 ft. high and 14 ft. wide, walls of brick and ceiling of concrete. General illumination was provided in the firing room by small lamps in diffusing glassware. Across the tunnel at the 50 and 75 yard points were placed mirrored trough reflectors with 25 watt lamps and a similar unit was placed in front of the targets. Heavy crystal glass plates set in the floor in front of each target permitting the diffused light to pass through it, illuminate the telephones and provide sufficient light for the scorers in the butts to prepare fresh targets. The auxiliary lighting along the tunnel prevents the extreme contrast which would be present if the targets alone were illuminated.

Offices, Board and Company Rooms

These are in fact club rooms with uses similar to those of the residential living room. Decorative yet comfortable lighting should be provided, the intensity must be fairly high and illumination even, owing to the diversified requirements; for cards, reading or writing in any part of the room, piano playing and singing. There seems to be a tendency to decorate the rooms with dark finishes which, of course, detract from the apparent brightness of the room. The furnishings of some of these rooms are very elaborate. Yet in many such cases but little attention has been paid to the lighting system and its decorative qualities have been neglected. The fixtures used are often quite commercial, whereas an excellent field is offered for special designs in etched and colored glassware and appropriate metal work. One can conceive how the artist could work into the glass decoration, the company letter, U.S.A. monogram, or the eagle in a similar manner to those emblem bowls designed for lodge rooms with the elk's head, square and compasses, etc. Diffused semi-indirect lighting with appropriate fixtures seems to be one logical method of treating this part of the building.

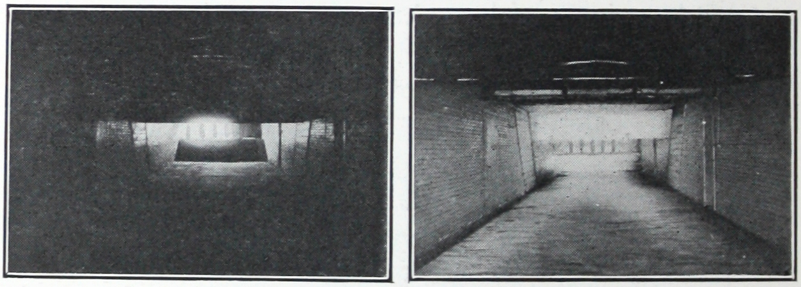

Fig. 8

Photographs Showing the Contrast Between a Rifle Range with Local Lighting at the Targets and with Floodlighting. Quite different firing conditions are produced. In the former case a brightly lighted area is surrounded by comparative darkness, in the latter case considerably less contrast is introduced

Company Locker Rooms

Utility of equipment is essential here; bowl enameled Mazda lamps located between rows of lockers and fitted with RLM standard dome reflectors are particularly applicable. Somewhat higher illumination should be provided in the neighborhood of the mirrors to facilitate dressing.

Company Store Rooms

The accoutrements and spare supplies are placed on racks or shelves and must be fairly well illuminated for inspection and ease of locating a given article. Efficient equipment as just described, should be so placed that an even intensity will be produced over the shelves. The work bench, which is often located in this room, should have one or two well shaded localized lamps; for minor repairs and cleaning of arms and other apparatus is carried on here.

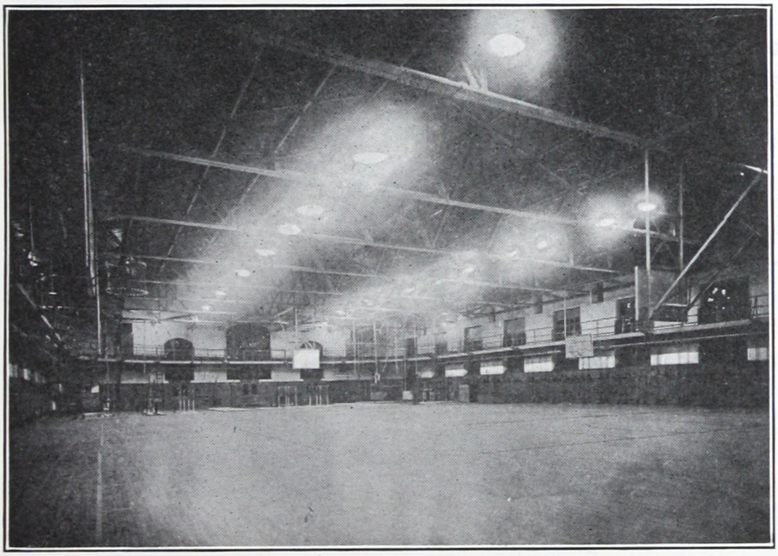

Fig. 9

Night Photograph of a Gymnasium Lighted by 200-watt Bowl Frosted Mazda C Lamps in Enamel Dome Reflectors. The room is 100 by 165 ft. with a 40-ft. ceiling, walls are cream and ceiling brown. 0.5 watts per square foot produces an average illumination of 3 foot-candles very evenly distributed, the ratio of maximum to minimum illumination being but 1.3. Illumination tests on the walls beneath the running track indicated an illumination on the apparatus of approximately 1 foot-candle

Corridors

A low intensity of light is sufficient in the less frequented parts of the building to prevent stumbling, but in the main corridors enough illumination to readily recognize a passerby, with sufficient excess to avoid any danger of accident in the event of a crowded condition.

The band room, quartermasters' and armorers' departments offer no special problems beyond that of the average interior.

Stables

The stables for the cavalry horses are often located in the basement of the armories; comparatively little light is required and the lamps should be of low candle-power, so that they can be placed at fairly frequent intervals without excessive energy being consumed.

The ceilings are usually low and if too wide spacing is used some of the stalls will be in deep shadow. A fairly satisfactory arrangement is found in one armory where there is an aisle approximately 15 ft. wide between rows and stalls. Two rows of 25 watt clear lamps are used in each aisle without reflectors close to the whitewashed ceiling, one in front of every second stall. This gives plenty of light for harnessing, cleaning and feeding the horses, and the passageway is well illuminated.

Gymnasium

General Considerations—Main Exercising Floor

This is usually rectangular in shape with a moderate height of ceiling. The arrangement most frequently used has the running track as a balcony 6 to 8 ft. wide around all four sides of the room. In the center of the main floor are the principal pieces of apparatus, horses, bucks, jumping standards, and parallel bars, while the flying rings and horizontal bars hang from the main ceiling. These can usually be pushed aside or drawn up out of the way for basketball, indoor baseball and wrestling, matches or practise. Below the balcony are found the exercisers of the various types and racks for wands, dumb-bells and Indian clubs.

The center part of the space requires even illumination of a moderate intensity with lamps so located that the hanging apparatus will not cause dense shadows. Particular attention should be paid to the shielding of the eye from the lamp filament, for one is forced to look upward a great deal when playing basketball and often faces the ceiling in ring and bar work. A blinding effect is particularly serious at such times and may cause a bad accident.

The illumination on the apparatus attached to the side wall below the track need not be as high as in the open space, yet in many cases it is necessary to provide a few outlets here with small lamps properly shaded to prevent dense shadows.

The general discussion on choice of a unit given under armories applies here also.

In investigating the lighting of gymnasiums, data was collected on the equipment utilized in 42 typical Y. M. C. A., high school and college buildings. It was unfortunate that nearly 50 per cent of those examined employed old style equipment consisting of 3-4 or 12 lamp cluster bodies with flat white glass or enamel steel reflectors. These were, in general, placed close to the ceiling and surrounded by wire cages or guards. This type of fixture is unsightly, gives a very poor distribution of light and is inefficient, as light from one lamp must pass through the adjacent partially blackened bulbs. These flat clusters have the particular objection that they expose the entire filament.

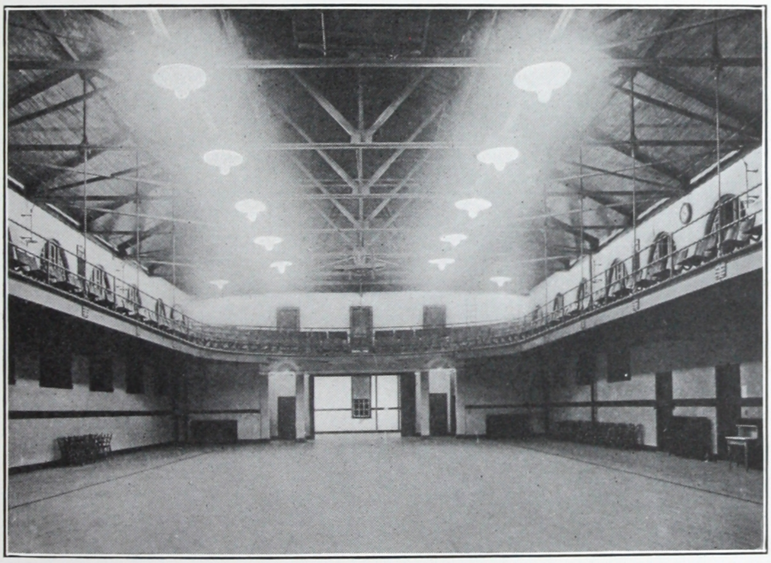

Fig. 10

Night Photograph of a Gymnasium 60 by 120 ft., Lighted by 400-watt Clear Mazda C Lamps in Semi-enclosing Units Consisting of a Diffusing Glass Dish Suspended Beneath a Large Porcelain Enameled Steel Reflector; 1 Watt per Square Foot is Provided

Of the twenty-two gymnasiums with modern equipment, the following types were employed; their properties are discussed under armories.

Enamel Steel, Dome Shape—7
Enamel Steel, Deep Bowl Shape—1
Mirrored Glass, Deep Bowl Shape—4
Prismatic Glass, Deep Bowl Shape—2
Opalescent Glass, Flat Type—2
Opalescent Enclosing Globe—3
Opalescent Enclosing Globe with Enamel Steel Reflector—2
Opalescent Glass Semi-Indirect Dish—1

In these twenty-two buildings the minimum watts per square foot was .42; the maximum 2.0; the average .78. The average generated lumens per square foot was 9.0. As most of the equipment employed is of an efficient character and side walls are generally light in color varying from white to natural brick and the ceiling, in contrast to the dark ceiling of the armory, usually also light, a fair average figure for the intensity of the illumination provided is between 4 and 5 foot-candles.

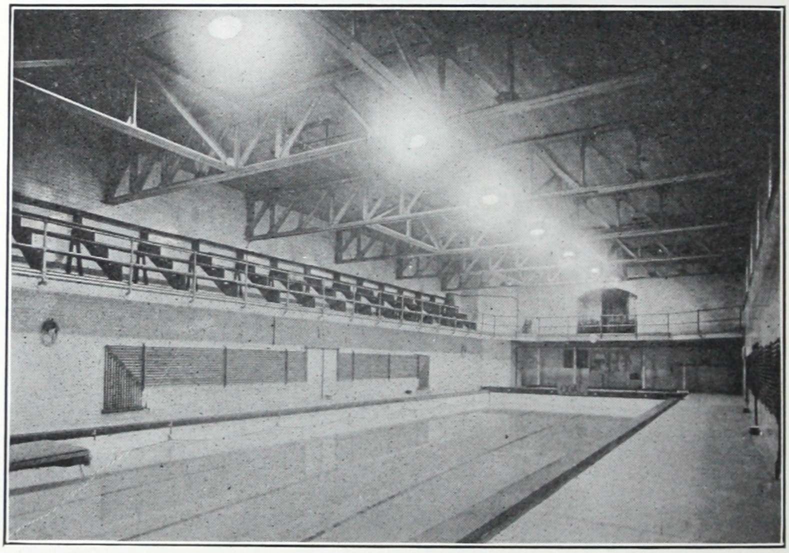

Fig. 11
Night Photograph of a Swimming Pool, 35 by 130 ft., Lighted by 7 200-watt Bowl Frosted Mazda C Lamps in Dome Enameled Steel Reflectors Located in a Single Row in the Center of the Room. The illumination on the surface of the water is approximately 2 foot-candles. It is interesting to note the clearness with which the lanes in the bottom of the pool can be discerned

The size of lamp varies from 60 watt vacuum type to 750-watt gas filled or MAZDA C lamps.

In some instances, the ceiling of the building is of such a character that efficient lamps in deep bowl mirrored glass reflectors can be recessed so that the mouths of the reflectors are flush with the ceiling. This arrangement directs light strongly downward; lamps are not visible unless one looks directly upward and there is no danger of breakage.

Sometimes when opaque reflectors are used for direct lighting, a number of small lamps are also provided in inverted reflectors which direct light to the ceiling and prevent this from being totally dark.

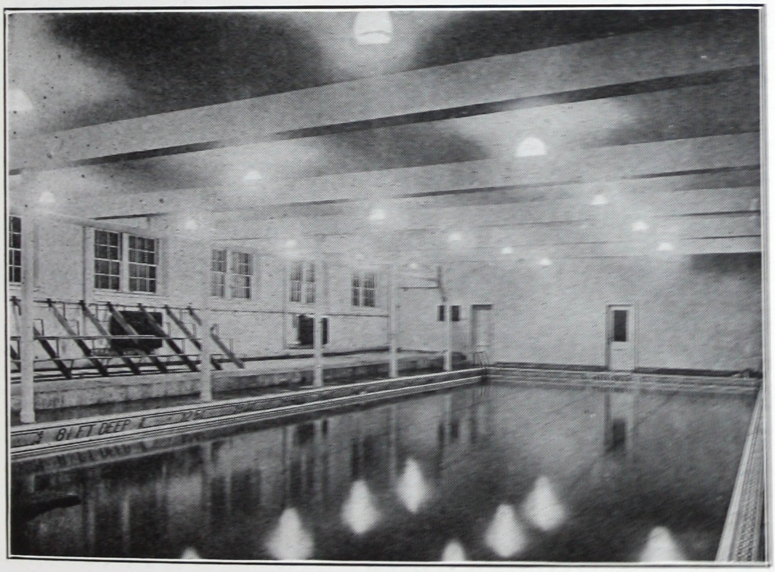

FIG. 12
Night Photograph of a Swimming Pool Lighted by 100-watt Bowl Frosted MAZDA Lamps in Bowl Shaped Light Dense Opalescent Glass Direct Lighting Reflectors. 0.7 watts per square foot is provided

Where direct lighting with opaque reflectors is employed for the main portion of the floor, it is sometimes advisable to utilize bowl shaped opalescent glass units beneath the running track or balcony. These provide good illumination on the side wall apparatus and at the same time emit some light in a horizontal direction, overcoming the "dead" effect which results if only strongly directional light is employed.

Swimming Pool

This room, from a lighting standpoint, is practically a modified Ulbricht sphere, for the side walls and ceiling are generally white tile. The type of reflecting device employed makes but little difference in the illumination. Care should, of course, be taken to insure satisfactory eye protection.

An examination of 8 pools using the following reflecting devices, prismatic glass bowl, opalescent glass bowl, mirrored glass bowl and enamel steel reflectors, showed the watts per square foot employed to vary from .3 to .7 with an average of .5.

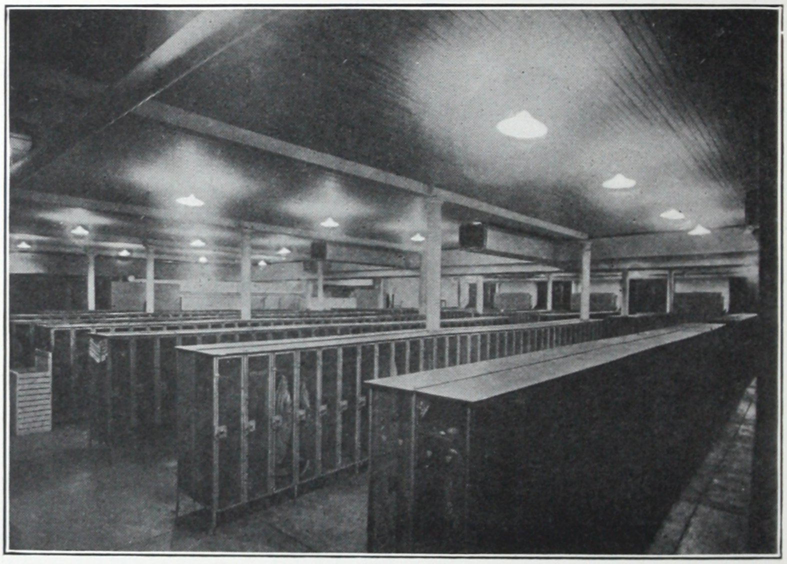

FIG. 13
Night Photograph of a Gymnasium Locker Room Lighted by 60-watt Clear MAZDA Lamps in Flat Prismatic Glass Reflectors. The room is finished in dull gray paint, and lamps are spaced 8 by 14 ft. located close to the 11-ft. ceiling

Shower and Locker Rooms

In the shower room, there is no special problem in regard to lighting, but on account of the high percentage of vapor present in the air, it is advisable that moisture-proof electric fittings be employed.

In the locker rooms, double rows of lockers with aisles between in most cases extend to the ceiling. The athletes dress in these aisles. Mirrors are ordinarily placed at the ends of rows on the main aisle. Low ceilings of light color make practical the use of low candle-power, all frosted lamps without reflectors, with sockets set flush. In a number of the installations examined 25-watt lamps are used on 8 ft. centers. Larger lamps with suitable reflectors localized near the mirrors on the main aisle are essential. A 60-watt lamp with bowl-shaped dense opal reflector between pairs of mirrors proves satisfactory.

Running Track

Although in most cases this extends about the main exercising room and the general illumination is sufficient for the track, sometimes a long track is installed in the form of a low tunnel. For such conditions, angle type reflectors pointing in the direction the runner is proceeding avoids any likelihood of glare and directs the light where it is required.

Miscellaneous Exercising Rooms

These comprise the wrestling, boxing and fencing rooms, together with the medical director's office. Fencing requires a relatively high intensity of illumination and it is probable that one room only will be provided for all these sports. In such cases the lighting layout must be considered from the standpoint of fencing.

Since the action is rapid, it is essential that the light be well diffused and of high intensity in order that all movements may be readily followed.

The finish of these rooms is usually light in color with smooth ceilings, making indirect and semi-indirect systems of illumination quite feasible. Approximately 1 watt per square foot of floor area with MAZDA C lamps proves satisfactory with semi-indirect lighting. As the rooms are often decorated with prizes, penants, etc., the decorative element of the fixture is important.

In the medical director's office, the ordinary requirements for office lighting are experienced, as well as the necessity for plenty of light in all parts of the room for physical examinations. Totally indirect or dense glass semi-indirect units are suitable.

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Butte, Mont	Electric Building
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Charlotte, N. C	Commercial National Bank Building
Chattanooga, Tenn	James Building
*CHICAGO, ILL	Monadnock Building
*CINCINNATI, OHIO	Provident Bank Building
Cleveland, Ohio	Illuminating Building
Columbus, Ohio	The Hartman Building
Dayton, Ohio	Schwind Building
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Detroit, Mich	Dime Savings Bank Building
Duluth, Minn	Fidelity Building
Elmira, N. Y	Hulett Building
Erie, Pa	Commerce Building
Ft. Wayne, Ind	1600 Broadway
Indianapolis, Ind	Traction Terminal Building
Jacksonville, Fla	Heard National Bank Building
Joplin, Mo	Miners' Bank Building
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Knoxville, Tenn	Burwell Building
*Los Angeles, Cal	Corporation Building, 724 S. Spring Street
Louisville, Ky	Starks Building
Memphis, Tenn	Randolph Building
Milwaukee, Wis	Public Service Building
*Minneapolis Minn	410 Third Avenue, North
Nashville, Tenn	Stahlman Building
New Haven, Conn	Second National Bank Building
*New Orleans, La	Maison-Blanche Building
*NEW YORK, N. Y	Equitable Building, 120 Broadway
Niagara Falls, N. Y	Gluck Building
Omaha, Neb	Electric Building
*PHILADELPHIA, PA	Witherspoon Building
*Pittsburgh, Pa	Oliver Building
*Portland, Ore	Electric Building
Providence, R. I	Turks Head Building
Richmond, Va	Virginia Railway and Power Building
Rochester N. Y	Granite Building
*Salt Lake City, Utah	Newhouse Building
*SAN FRANCISCO, CAL	Rialto Building
Schenectady, N. Y	G. E. Works
Seattle, Wash	Colman Building
Spokane, Wash	Paulsen Building
Springfield, Mass	Massachusetts Mutual Building
*ST. LOUIS, MO	Pierce Building
Syracuse, N. Y	Onondaga County Savings Bank Building
Toledo, Ohio	Spitzer Building
Washington, D. C	Commercial National Bank Building
Youngstown, Ohio	Stambaugh Building

*For Texas, Oklahoma and Arizona business refer to:
SOUTHWEST GENERAL ELECTRIC COMPANY (formerly Hobson Electric Co.)

DALLAS, TEXAS	Interurban Building
El Paso, Texas	500 San Francisco Street
Houston, Texas	Third and Washington Streets
Oklahoma City, Okla	1 West Grande Ave.

*Stock of lamps at these points.

EDISON LAMP FACTORIES

Harrison, N. J.
East Boston, Mass.
Ft. Wayne, Ind.
Newark, N. J.
Lynn, Mass.
Ampere, N. J.
Oakland, Cal.